USDA

ANNUAL TECHNICAL REPORT

United States
Department of Agriculture

Jimmy Carter
Plant Materials Center

Natural Resources
Conservation Service

1997

Americus, Georgia

A Technical Summary of Plant Materials Projects
at the Jimmy Carter Plant Materials Center
Americus, Georgia

STAFF

Charles M. Owsley	PMC Manager
Malcome S. Kirkland	Asst. PMC Manager
Glenda G. Roach	Biol. Sci. Tech(Plants)
Larry L. Vanzant	Biol. Sci. Aid(Plants)
Arnie Jones, Jr.	Biol. Sci. Aid(Plants)

STATE CONSERVATIONISTS ADVISORY COMMITTEE

Earl Cosby	Athens, GA - Chairman
Mark Berkland	Columbia, SC
Ronnie D. Murphy	Auburn, AL
Mary Kolstead	Raleigh, NC
James Ford	Nashville, TN

PLANT MATERIALS CENTER TECHNICAL COMMITTEE

Jim Dial, SRC	Athens, GA
John Meetz, SRC	Auburn, AL
Ronnie Feaster, SRC	Columbia, SC
John Lawrence, SRC	Gainesville, FL
Edward D. Surrency, PMS	Athens, GA
Samuel Sanders, PMS	Gainesville, FL
Roger Hansard, PMS	Raleigh, NC
Dr. Jerry Cherry, UGA	Athens, GA
Dr. Jorge Mosjidis, AU	Auburn, AL
Dr. Edzard van Santen, AU	Auburn, AL
Dr. Mark Latimore, FVSU	Ft. Valley, GA
Dr. Joe Bouton, UGA	Athens, GA
Dr. James Hill, TU	Tuskegee, AL
Dr. Earl Roden, TU	Tuskegee, AL
Dr. Larry Dyck, CU	Clemson, SC
Donald Dotson, ASTC	Nashville, TN
James Williams, CWT	Columbia, SC
Gilbert Lovell, Coordinator	Griffin, GA
Levi Glover, USDA Liaison	Ft. Valley, GA
Simon Gilmore, USDA Liaison	Orangeburg, SC
Dennis Law, USFS	Columbia, SC
Sid B. Brantly, RGS	Auburn, AL
Joel Douglas, PMC Mgr.	Coffeeville, MS
Richard Oliver, Asst. SC	Athens, GA
Ed Hacket, WS	Jackson, MS
GA S&W Cons. Commission	
Charles M. Owsley, PMC Manager	Americus, GA
Malcome S. Kirkland, Asst. PMC Manager	Americus, GA

JIMMY CARTER PLANT MATERIALS CENTER
AMERICUS, GEORGIA

ANNUAL TECHNICAL REPORT
1997

TABLE OF CONTENTS

JIMMY CARTER PLANT MATERIALS CENTER

INTRODUCTION

The Jimmy Carter PMC was established in 1936 to produce planting materials, mainly pine seedlings for use by the CCC Camps and the former Soil Conservation Service (SCS) demonstration projects. The center's land includes seven soil types, with Orangeburg predominating on its 327.39 acres. Approximately two-thirds of the land is open for cultivation, and Muckalee Creek runs through the southwest corner, furnishing water for irrigation.

The real property holdings at the facility consist of 327.39 acres of land with 19 buildings, an underground irrigation system that covers about 85 acres, a water supply system, and a sewage disposal system.

MISSION

The mission of the NRCS-PMC program is to assemble, test, and release plant materials for conservation use; determine techniques for their successful use; provide for their commercial increase; and promote the use of plant materials needed to meet the objectives and priorities of the National Conservation Program. Refer to the 1997 Jimmy Carter PMC Annual Activity Report for more details on PM programs and priorities.

COOPERATIVE AGREEMENTS

The PMC works cooperatively with the University of Georgia, Auburn University, Fort Valley State University, Tuskegee University, and Alabama A&M University on several mutually beneficial projects. The plant materials program also works with the Environmental Protection Agency (EPA), Georgia Department of Natural Resources (DNR), Department of Defense (DOD), and other state and federal agencies.

The PMC works with the Georgia and Alabama Crop Improvement Associations regarding foundation seed fields and seed processing facilities.

DESCRIPTION OF THE AREA

The Jimmy Carter PMC serves Alabama, Georgia, South Carolina, North Carolina, and parts of Tennessee and Florida. These states present a wide range of climatic and soil conditions.

Elevations range from sea level to over 6,000 feet. Low temperatures will vary from -20 degrees F at the higher elevations to 10 degrees F along the coast while summer high temperatures range from 70 F in the mountains to 110 F at lower elevations.

Frost free days vary from 260 days near the coast to 130 days at the higher elevations.

Annual rainfall over the area ranges from 45 to 80 inches.

The states served by the center are represented by the eleven major land resource areas.

MAJOR LAND RESOURCE AREAS SERVED

123 Nashville Basin
128 Southern Appalachian Ridges and Valleys
129 Sand Mountain
130 Blue Ridge
133A Southern Coastal Plain
134 Southern Mississippi Valley Silty Uplands
135 Alabama and Mississippi Blackland Prairies
136 Southern Piedmont
137 Carolina and Georgia Sandhill
152 Gulf Coast Flatwoods
153 Atlantic Coast Flatwoods

Soil Conditions vary widely -- deep droughty sand, heavy plastic clay subject to excessive intermittent wetness and drying, highly acid to alkaline extremes, and swamps and marshes - fresh and salt. Farming enterprises also vary widely. The area contains a number of heavily populated suburban areas surrounding centers of industry and commerce. The mountains, seashore, and other areas of natural beauty are being rapidly developed to meet the demand for recreation.

Such diversity of climate, soil, and enterprises requires many different types and kinds of vegetation to provide for protecting the land when it is properly treated for soil and water conservation.

SUMMARY OF WEATHER CONDITIONS - AMERICUS, GEORGIA - 1998
69 YEARS(1929 - 1998)

	Temperature(F)		Precipitation(Inches)			
Month	1998 Max.	1998 Min.	Mo. Total	69 Year Average	69 Year High Mo.	69 Year Low Mo.
January	**73**	**23**	**5.32**	**4.46**	**11.19**	**.64**
February	**77**	**28**	**7.05**	**4.72**	**12.28**	**.75**
March	**85**	**22**	**6.22**	**5.30**	**12.11**	**.48**
April	**85**	**40**	**8.68**	**3.87**	**12.26**	**.00**
May	**95**	**46**	**2.46**	**3.36**	**8.35**	**.14**
June	**100**	**55**	**.75**	**4.21**	**11.43**	**.03**
July	**100**	**69**	**2.10**	**5.27**	**24.79**	**1.25**
August	**101**	**61**	**1.05**	**4.01**	**11.76**	**.99**
September	**100**	**55**	**8.65**	**3.41**	**11.54**	**.10**
October	**88**	**40**	**.20**	**2.13**	**9.60**	**.00**
November	**85**	**34**	**.75**	**3.03**	**10.63**	**.05**
December	**81**	**25**	**1.30**	**4.18**	**12.29**	**.42**
TOTAL			**44.53**	**47.95**		

The coldest day of the year was March 11. The last day of frost was March 23. The Hottest days of the year were August 29-31. The first killing frost was November 7.

PROJECT 13I128R - ASSEMBLY AND EVALUATION OF BIG BLUESTEM (*ANDROPOGON GERARDI)*

INTRODUCTION:

Big bluestem (*Andropogon gerardi*) is a perennial, warm season grass. It is cross-pollinated and has several ploidy levels X = 20, 40, 60. Big bluestem is photoperiod sensitive. It is widely distributed in the United States. It occurs in tall grass prairies of the midwest as well as in forested areas of the southeast. It has been utilized for forage and hay production. This study attempts to evaluate big bluestem ecotypes for cultivar development.

MATERIALS AND METHODS:

In 1989-1990, the PMC assembled 750 vegetative ecotypes of southeastern big bluestems. These ecotypes were placed into an initial evaluation block. Each entry was planted to ten foot rows with one foot between clones. All entries were separated by three foot middles. Each entry was replicated twice.

RESULTS AND DISCUSSION:

In 1990 and 1991, the evaluation process began. The following were the evaluation criteria: 1) vigor, 2) stem color, 3) inflorescence color, 4) foliage amount, 5) foliage height (cm), 6) foliage color, 7) forage potential, 8) disease/insect resistance, 9) boot date, bloom date, maturing date, and percent germ, 10) seed amount, 11) uniformity, 12) leaves height on stem, 13) total height, 14) stem size, 15) tillering, 16) steminess, 17) basal foliage, 18) lodging, 19) late maturity.

In spring 1992, Dr. Edzard van Santen of Auburn University began a cooperative big bluestem study with the Jimmy Carter PMC. The following criteria were added to the existing evaluation process: 1) percent stand, 2) forage mass, 3) greening up date, 4) biomass at flowering (green weight and dry weight), 5) surface area of plot, and 6) morphological data.

In June 1993, four pairs of cow/calf units were allowed to graze the big bluestem area. Cattle were removed and Dr. van Santen evaluated the cattle's preference for specific ecotypes. After regrowth, cattle were again allowed to graze the vegetation down to 8-inch stubble residues.

Dr. van Santen's data was processed and helped to determine which ecotypes should be selected for crossing blocks in 1994. These blocks should produce germplasm for comparison testing against a standard big bluestem cultivar. The first three blocks consisted of early maturing ecotypes, late maturing ecotypes and medium maturing ecotypes (biomass selections):

Early maturing crossing block
Lines - 23, 52, 54, 62, 71, 78, 81, 84, 94, 97, 140, 142, 161, 231, 260, 305, 322, 336, 351, 368, 481, 484, 542, 561, 578, 595, 624, 661, 676, 704,719

Medium maturing crossing block
Lines - 1, 7, 10, 18, 20, 38, 44, 57, 61, 69, 75, 77, 85, 88, 89, 91, 93, 111, 116, 159, 200, 204, 223, 373, 432, 438, 452, 496, 497, 513, 532, 560, 580, 592, 598, 627, 689, 691, 709, 738

Late maturing crossing block
Lines - 4, 14, 32, 42, 46, 48, 50, 58, 59, 66, 73, 76, 98, 99, 106, 107, 122, 123, 124, 126, 127, 130, 131, 134, 143, 366, 399, 406, 692

Each line was represented by three replications per crossing block to ensure proper pollination.

In 1995, seed was collected from the three crossing blocks. All seed collected expressed high dormancy characteristics. Dr. van Santen is currently working to resolve this seed dormancy problem.

In 1996 and 1997, seed was again collected from the three crossing blocks. We hope to establish three crossing blocks of forage type big bluestem in 1998.

PROJECT 13I131R - ASSEMBLY AND EVALUATION OF SWITCHGRASS (*PANICUM VIRGATUM)*

INTRODUCTION:

Switchgrass (*Panicum virgatum*) is a perennial, warm season grass. It is cross-pollinated and has several ploidy levels X = 18, 36, 54, 72, 90 and 108. Switchgrass is photoperiod sensitive. It is widely distributed in the United States. It occurs in tall grass prairies of the midwest as well as in forested areas of the southeast. It has been utilized for forage and hay production. This study attempts to evaluate switchgrass ecotypes for cultivar development.

MATERIALS AND METHODS:

In 1990-1992, the PMC assembled 1,098 vegetative ecotypes of southeastern switchgrass. These ecotypes were placed into an initial evaluation block. Each entry was planted to 13-foot rows with three plants per row. All entries were separated by 3-foot middles. Each entry was replicated twice.

RESULTS AND DISCUSSION:

In 1993, the evaluation process began. The following are the evaluation criteria: 1) greenup date, 2) forage mass, 3) vigor, 4) stand, 5) leafiness, 6) disease/insect resistance, 7) foliage height, 8) stem size, 9) boot date, 10) leaf texture, 11) leaf size, 12) leaf/stem ratio (steminess), 13) bloom date, 14) foliage color, 15) maturing date, and 16) seed amount.

In 1994, we emphasized regrowth, height, blooming, maturing and seed collection. Also a greenhouse compatibility study was conducted to help determine crossing compatibility of lines with like and unlike morphological characteristics.

In 1995, seeds from the following lines were collected for future germplasm work: (Biomass type) 1079, 1080, 1083, 421901, 422001, 2091, and 2083; (forage type) 396, 407, 936, 619, 995, 1012, 1063, 810, 998, 2092, 915, 916, and 422003.

These procedures were repeated in 1996. In 1997 all seed was cleaned and processed for future germplasm tests

PROJECT 13A139R - GRAZING TEST OF INDIANGRASS CULTIVAR FOR PLANT SURVIVAL

INTRODUCTION:

Yellow indiangrass, (*Sorghastrum nutans*), is a native perennial warm season grass. It has been utilized for forage and hay production. This test attempts to determine the survivability of PI-514673 indiangrass, ‘Lometa’ indiangrass, and ‘Pensacola’ bahiagrass in a controlled grazing test.

MATERIALS AND METHODS:

This test is a split-plot design with main-plots called grazed and ungrazed. Within the main-plots are 12 replications each of the three grasses. These plots, called sub-plots are 10' X 10' in size. Survivability is determined by taking stem counts during the life of the test. The grazed main-plot is grazed when indiangrass reaches 18" in height. Cattle are allowed to graze the indiangrass to an 8" stubble.

RESULTS AND DISCUSSION:

In 1995, the grazed main-plot was grazed only once (July). An analysis of covariance was run using early July stem count (initial stem count), as a covariant, and September stem count (final stem count), as the response. This should reflect the effect of the July grazing on the grasses survivability. However, the analysis of covariance indicated there was no grazing effect, there was no interaction between grazing and the grasses. There was a significant difference between grasses and a significant covariate.

The analysis indicates Pensacola bahiagrass produced significantly more final stem counts than PI-514673 or 'Lometa'. Also, 'Lometa' produced significantly more final stem counts than PI-514673. (Table 1)

It is not surprising that there was no grazing effect, since only one grazing event occurred in 1995. It is also not surprising that Pensacola bahia, which produces many stolons along the ground surface, produced more final stem counts than either indiangrass.

In 1996, the grazed main-plot was grazed twice (June and August). An analysis of covariance was run using the initial stem count of 1995 as the covariant and the final stem count (October) of 1996 as the response. There was a significant difference between grazed and ungrazed. We had a difference between grasses, and a significant interaction of grazing and grasses. The analysis of covariance also indicated a significant covariant. Since an interaction was indicated, the data was analyzed for grazed and ungrazed separately. The analysis for covariance grazed indicated a grass difference and a significant covariate. Using pair comparisons, 'Pensacola' bahia produced a higher final stem count than PI-514673 and 'Lometa'. Also 'Lometa' barely produced a higher final stem count than PI-514673. (Table 2)

The analysis for covariance ungrazed indicated no significant covariant. Therefore, an analysis of variance was run. This indicated a significant grass difference under ungrazed. 'Pensacola' bahia produced a higher final stem count than PI-514673 and 'Lometa'. However, PI-514673 produced a higher final stem count than 'Lometa'. (Table 3)

We also analyzed the data utilizing survivability stem ratio =

$$\frac{\text{final stem count 1996}}{\text{initial stem count 1995}} \times 100$$

as the response. Analysis of variance indicated an interaction between grazing and the grasses. Therefore, we analyzed grazed and ungrazed separately. Analysis of grazed indicated 'Pensacola' bahia had a higher ratio than 'Lometa' or PI-514673. However, there was no significant difference between 'Lometa' and PI-514673. (Table 4)

Analysis of ungrazed indicated PI-514673 produced a higher stem ratio than 'Lometa' and a higher ratio than 'Pensacola' bahia. (Table 5)

Using Saithewaite method to determine degree of freedom of error, we calculated an LSD for stem ratio of PI-514673 at grazed and ungrazed and 'Lometa' at grazed and ungrazed. The ratio was higher for the ungrazed PI-514673 than for the grazed PI-514673. However, there was no significant difference between the 'Lometa' grazed and 'Lometa' ungrazed. (Table 6)

In 1997, the grazed main-plot was grazed twice (July and August).

The data was analyzed utilizing stem ratio to determine survivability.

$$\frac{\text{final stem count 1997}}{}$$

initial stem count 1995 X 100

This ratio was the response variable.

Analysis of variance indicated a significant interaction between grazing and the grass types. Therefore, grazed data and ungrazed data was analyzed separately.

Analysis of grazed data indicated 'Pensacola' bahia had a higher ratio than 'Lometa' or PI-514673. However, there was no significant difference between 'Lometa' and PI-514673. (Table 7)

Analysis of ungrazed data indicated no significant difference between PI-514673 and 'Pensacola' bahia. However, PI-514673 produced a higher stem ratio than 'Lometa'. (Table 8)

Using Saithewaite method to determine degree of freedom of error, an LSD value was calculated for stem ratio of PI-514673 at grazed and ungrazed and 'Lometa' at grazed and ungrazed. The survival ratio was higher for ungrazed PI-514673 than for grazed PI-514673 (Table 9). However, there was no significant difference between 'Lometa' grazed and ungrazed. (Table 9)

To summarize through 1997, 'Pensacola' bahia survival ratio looks good whether grazed or ungrazed. Under grazed conditions, there is no difference between PI-514673 and 'Lometa'. However, under ungrazed conditions, the survival stem ratio of PI-514673 is higher than 'Lometa'. PI-514673 produces a better ratio ungrazed than it does grazed. While 'Lometa' shows no difference between grazed or ungrazed.

TABLE 1 JIMMY CARTER PMC STEM COUNT (1995)

Cultivar	Adjusted Final Stem Count Means
PI-514673	212.2
'Pensacola' bahiagrass	568.4
LSD (.05)	97.63
PI-514673	212.2
'Lometa'	278.1
LSD (.05)	39.8
'Lometa'	278.1
'Pensacola' bahiagrass	568.4
LSD (.05)	86.4

CV = 18.4%

TABLE 2 JIMMY CARTER PMC STEM COUNT (1996)
GRAZED

Cultivar	Adjusted Final Stem Count Means
PI-514673	125.01
'Pensacola' bahiagrass	489.153
LSD (.05)	82.91
PI-514673	125.01
'Lometa'	156.671
LSD (.05)	31.566
'Lometa'	156.671
'Pensacola' bahiagrass	489.153

LSD (.05)	73.05

CV = 13.62%

TABLE 3 JIMMY CARTER PMC STEM COUNT (1996) UNGRAZED

Cultivar	Final Stem Count Means
PI-514673	208.9
'Lometa'	130.9
'Pensacola' bahia	495.4
LSD (.05)	56.02

CV = 23.76%

TABLE 4 JIMMY CARTER PMC STEM COUNT (1996) GRAZED

Cultivar	Stem Ratio	Final Stem Count 1996 / Initial Stem Count 1995 X 100
PI-514673		37.83
'Lometa'		51.58
'Pensacola' bahia		86.83
LSD (.05)		13.83

CV = 27.8%

TABLE 5 JIMMY CARTER PMC STEM COUNT (1996) UNGRAZED

Cultivar	Stem Ratio	Final Stem Count 1996 / Initial Stem Count 1995 X 100
PI-514673		124.8
'Lometa'		66.75
'Pensacola' bahia		90.58
LSD (.05)		31.42

CV = 39.45%

TABLE 6 JIMMY CARTER PMC STEM COUNT (1996)

	Stem Ratio	Final Stem Count 1996 / Initial Stem Count 1995 X 100
Grazed PI-514673		37.833
Ungrazed PI-514673		124.83

LSD (.05)	22.78
Grazed ‘Lometa’	51.58
Ungrazed ‘Lometa’	66.75
LSD (.05)	22.78

TABLE 7 JIMMY CARTER PMC STEM COUNT (1997) GRAZED

Cultivar	Stem Ratio	Final Stem Count 1997 / Initial Stem Count 1995 X 100
PI-514673		25.74
‘Lometa’		32.89
‘Pensacola’ bahia		72.91
LSD (.05)		13.91

CV = 37.47%

TABLE 8 JIMMY CARTER PMC STEM COUNT (1997) UNGRAZED

Cultivar	Stem Ratio	Final Stem Count 1997 / Initial Stem Count 1995 X 100
PI-514673		57.31
‘Lometa’		34.02
‘Pensacola’ bahia		66.65
LSD (.05)		17.36

CV = 38.93%

TABLE 9 JIMMY CARTER PMC STEM COUNT (1997)

Cultivar	Stem Ratio	Final Stem Count 1997 / Initial Stem Count 1995 X 100
Grazed PI-514673		25.74
Ungrazed PI-514673		57.31
LSD (.05)		15.42
Grazed ‘Lometa’		32.89
Ungrazed ‘Lometa’		34.02
LSD (.05)		15.42

PROJECT 13A140S - EVALUATION AND SELECTION OF PLANT MATERIALS FOR FOREST BUFFERS IN THE SOUTHEASTERN UNITED STATES

INTRODUCTION:

This test will consist of the following species: ogeechee lime, red maple, blackgum, green ash, cherry bark oak, loblolly pine, yellow poplar, bald cypress, water oak, sweetgum, white oak, and sycamore. They will be monitored for growth and survival as a forest buffer.

MATERIALS AND METHODS:

Plantings were established by use of dibbles in the winter of 1993/1994. One 54 foot x 100 foot block per species was planted on 6 foot spacings. Each block runs perpendicular to the slope, and was planted with 160 trees.

RESULTS AND DISCUSSION:

Information contained in Tables 1-5 will provide base line vegetative data to accompany any future surface or water well data. All growth means represent means of surviving material. Through 1997, the overall best growth data was expressed by the green ash block.

TABLE 1 MEAN % SURVIVAL OF FOREST BUFFER TREES

Tree Species	**August 1994**	**August 1995**	**August 1996**	**September 1977**
Loblolly pine	21	16 -	13	13
Yellow poplar	14	14 -	8	8
Sycamore	18	27 -	20	20
Blackgum	84	68	66	63
Cherrybark oak	91	89	89	89
Sweetgum	77	77	73	74
White oak	66	49	46	44
Bald cypress	81	71	70	68
Green ash	81	81	82	82
Red maple	88	76	71	72
Ogeechee lime	38	35	35	34
Water oak	75	73	70	70

TABLE 2 MEAN CROWN WIDTH (CM) OF FOREST BUFFER TREES IN AUGUST

Tree Species	(1994)	(1995)
Blackgum	22.13	54
Cherrybark oak	25.59	58
Sweetgum	27.3	52
White oak	24.78	41
Bald cypress	17.99	33
Green ash	65.83	94
Red maple	20.72	48
Ogeechee lime	40.10	78
Water oak	33.2	63

TABLE 3 MEAN HEIGHT (CM) OF FOREST BUFFER TREES

Tree Species	**August 1994**	**August 1995**	**August 1996**	**September 1997**

Blackgum	56.7	79	155	270.3
Cherrybark oak	56.73	96	207	312.5
Sweetgum	61.54	129	261	383.2
White oak	38.94	78	105	158.0
Bald cypress	57.36	87	146	216.0
Green ash	169.98	263	399	543.2
Red maple	56.18	108	219	342.0
Ogeechee lime	84.15	170	281	412.9
Water oak	60.26	100	197	350.8

TABLE 4 TRUNK DIAMETER OF FOREST BUFFER TREES

Tree Species	Mean Diameter Main Trunk Ground Level (mm)			
	August 1994	**August 1995**	**July 1996**	**September 1997**
Blackgum	7.232	14.4	26.6	35.2
Cherrybark oak	5.61	12.1	28.0	46.0
Sweetgum	10.54	24.5	42.3	65.5
White oak	6.73	11.0	19.4	24.5
Bald cypress	8.06	18.0	31.0	43.7
Green ash	25.49	46.4	69.7	82.7
Red maple	8.19	20.7	43.0	56.0
Ogeechee lime	16.57	35.6	64.3	110.5
Water oak	9.23	21.7	30.9	49.9

TABLE 5 CROWN WIDTH OF FOREST BUFFER TREES - SEPTEMBER 1997

Tree Species	Mean Crown Width (cm) at 1/2 Tree Height
Blackgum	170.6
Cherrybark oak	197.3
Sweetgum	165.3
White oak	97.5
Bald cypress	126.1
Green ash	289.4
Red maple	167.5
Ogeechee lime	315.2
Water oak	202.1

PROJECT 13A142R - GRAZING MANAGEMENT OF EASTERN GAMAGRASS

INTRODUCTION:

Eastern gamagrass (*Tripsacum dactyloides*) is a native perennial warm season bunch-grass. It is widely distributed in the United States. It occurs in most states east of the Mississippi River. It can be utilized for forage and hay production. It is a monoecious grass with morphology similar to maize. Gamagrass root stalk is a proliferation of tillers.

This project attempts to define management criteria for the production of Eastern gamagrass forage.

MATERIALS AND METHODS:

In April, 1993, cold stratified 'Pete' Eastern gamagrass seed was planted to five acres on the southern end of the Jimmy Carter PMC. A two row corn planter set on 36 inch rows was used to plant approximately four seed per linear foot of row (14 #/Ac.). Seed was planted 1 1/2 inches deep. Six hundred pounds of 0-14-14 fertilizer was applied at planting and 75 pounds of N per acre was applied in June. Weeds were primarily controlled by cultivation. The center suffered a severe drought in the summer of 1993, however, the field produced an abundant stand of Eastern gamagrass.

In 1994 - 1996, the gamagrass grew and covered the pasture area with lush growth.

In April, 1997, a single strand electric fence was used to divide the pasture into ten paddocks of approximately 0.4 acres each. The first week of May a portable water system was installed that could be moved from paddock to paddock as cattle were moved. A mineral block was placed in each paddock. May 13, the pasture was mowed to approximately 24" height. May 19, 600 pounds/acre of 10-10-10 fertilizer was spread on the pasture. On May 21, 15 uniform size heifers, approximately 650 pounds each, were delivered and turned onto the pasture, but because they were unfamiliar with the electric fence, they broke through the wire. They were then moved to a bermuda/bahia grass pasture. On June 3, ammonium nitrate at the rate of 50 pounds actual N per paddock was applied to the pasture.

In July, PMC personnel met with Sid Brantly, regional grazing lands specialist, and received training and instruction from him on procedures for an intensive grazing study of the Eastern gamagrass pasture.

August 5, the pasture was again mowed off to approximately 24" height. August 6 and 7 the cattle were corralled and trained to an electric fence. August 7, clippings were taken to determine amount of dry matter available for cattle. On August 11, another 50 pounds of N per paddock was applied to the pasture. August 11, the cattle, 15 heifers, were moved into paddock No. 1 for grazing. August 12, molasses was applied to the leaves of the Eastern gamagrass to encourage the cattle to begin eating this unfamiliar grass. On August 14, 3 1/2 days after introduction, the cattle were moved off of Paddock #1 to a new paddock. During the early stage of this second grazing period, August 15, fecal samples were taken to determine the quality of the Eastern gamagrass consumed by the cattle. On August 18, the end of grazing period, fecal samples were taken again to determine if any change had occurred in quality of feed. August 18, the cattle were moved to the third paddock. August 19, fecal samples were again taken at the early stage of the grazing period.. Fecal samples were taken on August 21, at end of grazing period, again this was to check for a change in feed quality. This sequence of rotation was continued through August. Each rotation was approximately 3 1/2 days in length. Each paddock was grazed to about 10" stubble before cattle were rotated. This rate of movement did not allow cattle to graze regrowth material.

On September 2, the water supply, pumped from a creek, ran out. The cattle were then moved from the Eastern gamagrass pasture to a bermuda/bahia pasture where a more dependable water supply was located.

RESULTS AND DISCUSSION:

The amount of dry matter from the clippings ranged from 27% to 31% with yields of dry matter ranging from 4714 pounds/acre to 6000 pounds/acre.

Fecal samples taken showed a reduction in crude protein content from the early stage to the end of the grazing period. Early stage samples gave a 9% and 11.3% crude protein and the end of the grazing period showed a 7.7% and 10.1% crude protein respectively.

In 1998, a new demonstration is planned using 450-550 pound stocker steers.

PROJECT 13A144R - HAY AND GRAZING MANAGEMENT OF YELLOW INDIANGRASS(*SORGHASTRUM NUTANS*)

INTRODUCTION:

Yellow indiangrass (*Sorghastrum nutans*) is a native perennial warm season grass. It can be utilized for forage and hay production. This test attempts to demonstrate the use of a PMC selection known as PI-514673. Emphasis will be placed upon establishment and management techniques for forage production.

MATERIALS AND METHODS:

In the fall of 1993, a three acre bahia grass pasture was sprayed with Roundup. In February 1994, the pasture was disked. In March, 1994, 450#/Ac of 0-14-14 fertilizer was applied. On May 5, 1994 the pasture area was disked and cultipacked to firm the seedbed. Then the indiangrass seed was applied with a Solo fertilizer spreader set on No. 24 for a 12-14 foot swath. The rate of seeding was 25 #/Ac or 10# pls/Ac. The area was then cultipacked perpendicular to original cultipacking for proper seed covering. In June, 1994, broadleaf weeds were sprayed with 2-4-D at a rate of 1 qt/Ac. A good stand of indiangrass was observed during the summers of 1994 and 1995. In 1996, this field was utilized for indiangrass seed production.

In May, 1997, 10-10-10 fertilizer was applied at the rate of 600 #/Ac. The first week of June, 150 #/Ac of ammonium nitrate, 34-0-0, was spread on the area. On May 27, 2, 4-D herbicide was sprayed at 1 qt/Ac rate to control broadleaf weeds and again on June 10 because of poor results from first spraying. October 28, seeds were combined with a poor yield of only 28 pounds. Low seed yield was the result of a late summer drought.

Rotational grazing techniques are planned for implementation in future years.

PROJECT 13A147R - EASTERN GAMAGRASS INTER-CENTER STRAIN TRIAL

INTRODUCTION: Eastern gamagrass (*Tripsacum dactyloides*) is a native warm season (C4) perennial bunchgrass. It has long been recognized as a highly productive and palatable forage plant. Eastern gamagrass is a monoecious grass with morphology similar to corn. Diploid plants reproduce sexually while most tetraploids are facultative apomicts and hexaploids are obligate apomicts. A gynomonoecious sex form with the potential of increased seed production has been identified.

Eastern gamagrass is adapted to a wide variety of growing conditions. Its native range extends from Massachusetts, west to Michigan, Iowa and Nebraska, south to Florida, Oklahoma, and Texas. In addition to a wide range of adaptation, eastern gamagrass shows potential for a wide range of agricultural uses.

Since corn silage is such a large contributor to cropland erosion in the nation, the NRCS Big Flats PMC in New York is developing eastern gamagrass as a perennial silage that could reduce soil erosion and water quality problems.

There is growing interest in eastern gamagrass as a forage plant for the Southern United States. Several NRCS plant materials centers in the south are making progress in developing new eastern gamagrass cultivars. They have screened large populations of eastern gamagrass ecotypes for forage characteristics. The best materials from these screenings have been incorporated into a multi-regional study known as an Inter-Center Strain Trial (ICST). The ICST was initiated in 1995 at six southeastern PMC locations, (Knox City, Texas, Booneville, Arkansas, Coffeeville, Mississippi, Americus, Georgia, Brooksville, Florida, and Nacogdoches, Texas).

Since little information has been gathered in the south concerning eastern gamagrass forage quantity and quality, these two evaluation criteria are being emphasized in the ICST study. The results of this study should provide data for new eastern gamagrass cultivar releases adapted to the Southern United States.

This report details the establishment and two year results of the ICST conducted at the Jimmy Carter PMC in Americus, Georgia.

MATERIALS AND METHODS:

In 1995, plots were established with vegetative material from 13 accessions and one standard called 'Pete' (released by NRCS in 1988). Table 1 lists the plant materials and their origin. Plots were arranged in a randomized complete block design with four replications. In the spring, after most accessions were in boot stage, the test was clipped to 8" from the ground. Two additional clippings were taken each year on an approximate 45 day schedule. Dry matter yields were determined for each clip and yearly total clip. Forage quality measurements will be determined in the future. An analysis of variance was generated for each clip stage by utilizing MSTAT.

RESULTS AND DISCUSSION:

Two years of dry matter yield data from the Jimmy Carter PMC indicates the accession from Jackson County Texas produced the most consistent high yields (Table 2-3). In 1997 it produced the highest total yield in the test (Table 3). Other high yielders include accessions from New Mexico, Montgomery County Tennessee, Williamsburg County South Carolina, Hays County Texas, Florida 2, and Florida 3 (Tables 2-3). Fertilization for this test was scheduled each spring and after each clip event (Table 4).

After data collection in 1998, this test will be summarized and concluded.

TABLE 1 - EASTERN GAMAGRASS ENTRIES

Accession	State	County	PMC Origin
434493	TX	Hays	James E. "Bud" Smith, Knox City, TX
9066165	TX		Los Lunas, NM
9043762	TX	Medina	East TX, Nacogdoches, TX
9043629	TX	Nacogdoches	TX
9043740	TX	Jackson	TX
9062680	TN	Montgomery	Jamie L. Whitten, Coffeeville, MS
9062708	SC	Williamsburg	Jamie L. Whitten, Coffeeville, MS
9055975	FL1		Brooksville, FL
9059213	FL2		Brooksville, FL
9059215	FL3		Brooksville, FL
9058465	AR1		Booneville, AR
9058495	AR2		Booneville, AR
9058569	AR3		Booneville, AR
'Pete'			Commercial

TABLE 2 - DRY MATTER YIELD OF EASTERN GAMAGRASS ENTRIES BY HARVEST DATE AND TOTAL AT JIMMY CARTER PMC - 1996

	DM Yield Harvest Dates #/AC			
Entry	5/22	7/9	8/27	Total Yield
Montgomery	8974.625	6275.85	4386.85	19,637.3
Williamsburg	5576.65	6764.28	5017.03	17,358.0

Nacogdoches	----------	---------	---------	----------
Jackson	3695.4	7376.2	6319.8	17,391.4
Medina	3422.83	6096.8	5091.08	14,6l0.7
Hays	5600.95	6627.47	4844.18	17,072.6
New Mexico	6827.08	7377.03	5062.88	19,267.0
Ark 1	5259.08	5535.08	4505.9	15,300.1
Ark 2	4224.75	6151.45	5786.3	16,162.5
Ark 3	3216.2	4352.73	3l48.05	10,717.0
Flr 1	856.6	3153.15	2525.6	6,535.4
Flr 2	2557.88	6429.1	4554.03	13,54l.0
Flr 3	3l4l.35	74l4.73	4762.3	15,3l8.4
Pete	785l.4	5031.2	3578.2	l6,460.8
LSD (0.05)	1551	1076	768.7	2657
CV	22.98%	12.41%	11.7%	12.08%

TABLE 3 - DRY MATTER YIELD OF EASTERN GAMAGRASS ENTRIES BY HARVEST DATE AND TOTAL AT JIMMY CARTER PMC - 1997

	DM Yield Harvest Dates #/AC			
Entry	5/20	7/15	9/4	Total Yield
Montgomery	8362.65	4646.80	4396.78	17,406.237
Williamsburg	4896.53	7258.08	4293.85	16,448.46
Nacogdoches	4335.68	3533.74	3379.20	11,248.62
Jackson	8497.65	8089.99	5811.56	22,399.21
Medina	6126.28	6067.40	4310.44	16,504.11
Hays	6963.80	5732.85	5006.13	17,702.78
New Mexico	7686.20	4947.75	4338.25	16,972.22
Ark 1	7726.83	5001.28	3345.86	16,073.96
Ark 2	6171.50	3500.58	3121.26	12,793.33
Ark 3	3605.93	1966.96	342.99	5,915.86
Flr 1	2416.35	3059.17	2219.57	7,695.09
Flr 2	5498.95	6324.82	4359.44	16,183.20
Flr 3	6589.70	6703.8	4659.28	17,952.78
Pete	6636.30	3585.31	2507.94	12,729.54
LSD (0.05)	1224	1001	1072	2846
CV	14.00%	13.91%	20.15%	13.39%

TABLE 4 - EASTERN GAMAGRASS FERTILIZATION RECORD AT JIMMY CARTER PMC FOR 1996 - 1997

Date Applied	Fertilizer Type	Rate Applied (#/AC)
4-08-96	Murate of Potash	83.25
	Ammonium Nitrate	147
5-22-96	Murate of Potash	83.25
	Ammonium Nitrate	147
7-09-96	Murate of Potash	83.25
	Ammonium Nitrate	147
8-27-96	Murate of Potash	83.25

	Ammonium Nitrate	147
Total 1996	*Murate of Potash*	*333*
	Ammonium Nitrate	*588*
3-13-97	Murate of Potash	83.25
	Ammonium Nitrate	147
5-20-97	Murate of Potash	83.25
	Ammonium Nitrate	147
7-15-97	Murate of Potash	83.25
	Ammonium Nitrate	147
9-04-97	Did not apply any fertilizer	
Total 1997	*Murate of Potash*	*249.75*
	Ammonium Nitrate	*441*

The following summary of 1996-1997 ICST study in the Southeastern United States was provided by Joel Douglas (PMC Manager, Coffeeville, MS).

SIGNIFICANT FINDINGS:

There was a significant year x accession x location interaction, therefore, locations were analyzed separately (Table 1-3).

There was a significant year x accession interaction at all locations except Nacogdoches and Brooksville. Variability in yield between years for accessions is attributed to such factors as rainfall, which influenced number of cuttings (i.e., some locations made 3 cuttings in 1996 and only 2 cuttings in 1997) and regrowth following defoliation. Winter kill of several accessions at various locations also caused yield variability between years.

Florida accessions (9059213 and 9059215) performed best at Brooksville and Americus. Conversely, Florida accessions usually performed less than satisfactory at other locations. Accessions from Coffeeville, Knox City, Nacogdoches, and Booneville produced significantly lower yields in Florida.

Brooksville should release one of their accessions for Florida with potential for use in Southern Alabama and Southern Georgia.

After two years, accessions 434493, 9043762, 9066165, 9043740, 9058465, 9058495,9062708 and 9062680 produced sustainable yields at two or more locations.

Although the above mentioned accessions have shown favorable yield potential, percent seed set needs to be a major consideration when selections are made.

Table 1 - Total dry matter yield of eastern gamagrass accessions by year and location.

	DM Yield - **Knox City, TX**		DM Yield - **Nacogdoches, TX**	
Accession	1996	1997	1996	1997
	----------lb/acre----------		----------lb/acre----------	
434493	14 030	18 925	12 594	7328
9043629	6551	14 155	14 880	18 302
9043740	12 119	0	16 354	18 122
9043762	15 563	24 148	14 446	13 116
9055975	2121	0	3114	3644
9059213	3548	3640	8171	12 403

9059215	5078	3880	6654	9301
9058465	8876	18 156	13 522	15 048
9058495	10 868	19 418	13 064	10 846
9058569	6457	13 237	5169	3300
9062708	7773	13 466	12 996	12 305
9062680	10 820	16 041	15 276	14 778
9066165	13 873	17 346	14 044	10 410
Mean	9052	12 187	11 560	11 454
LSD (0.05)	4286	3926	7702	8565

Table 2 - Total dry matter yield of eastern gamagrass accessions by year and location.

	DM Yield - **Booneville, AR**		DM Yield - **Coffeeville, MS**	
Accession	1996	1997	1996	1997
	----------lb/acre----------		----------lb/acre----------	
434493	15 554	8 805	12 528	12 525
9043629	12 081	4936	9442	12 186 *
9043740	9185	5098	8754	13 420
9043762	13 581	11 020	11 311	0
9055975	4051	0	2032	0
9059213	4999	0	4971	0
9059215	4168	0	5950	0
9058465	13 033	7730	14 535	13 394
9058495	14 000	9916	12 877	20 019 *
9058569	12 332	5344	6859	12 101 *
9062708	13 566	8400	12 017	15 388
9062680	12 403	11 864	12 747	23 604 *
9066165	16 087	9048	14 149	12 120
Mean	12 229	6141	9859	10 366
LSD (0.05)	4206	1286	3724	4525

* Harvested three times

Table 3 - Total dry matter yield of eastern gamagrass accessions by year and location.

	DM Yield - **Americus, GA**		DM Yield - **Brooksville, FL**	
Accession	1996	1997	1996	1997
	----------lb/acre----------		----------lb/acre----------	
434493	17 073	17 703	6883	10 133
9043629	-------- *	11 249	2318	4966
9043740	17 392	22 399	1149	1399
9043762	14 611	16 504	4540	5233
9055975	6535	7695	9728	8923
9059213	13 541	16 183	8399	11 074
9059215	15318	17 953	10 790	14 780
9058465	15300	16 074	5670	6065
9058495	16162	12 794	2475	0
9058569	10717	5916	2248	0
9062708	17358	16 449	5007	6239

9062680	19 637	17 406	3368	5780
9066165	19267	16 973	4252	3123
Mean	15 243	15 023	5141	7065
LSD (0.05)	2144	2910	2788	4952

* Not harvested in 1996

PROJECT 13A148R - GRAZING MANAGEMENT OF SWITCHGRASS (*PANICUM VIRGATUM*)

INTRODUCTION:

Switchgrass is a native perennial warm season grass. It can be utilized for forage and hay production. This test attempts to demonstrate the use of 'Alamo' switchgrass. Emphasis will be placed upon establishment and management techniques for forage production.

MATERIALS AND METHODS:

In May, 1995, a six acre field was bottom plowed and disked. In June, 1995, the field was leveled with a field cultivator. The field was fertilized with 30 #/Ac of phosphorus and potassium. Switchgrass seed was applied to a cultipacked field, using a fertilizer spreader. Seeding rate was approximately 10 pounds pls/Ac. After seeding, the field was cultipacked perpendicular to the first cultipacking. Depth of seed was approximately 1/4 inch. A dry period delayed germination, however, a good stand was observed by the fall of 1995. Pigweed was controlled with one qt/Ac of 2, 4-D.

In June and July, 1996, 40 cows with calves, flash grazed this field for four days.

In June and July, 1997, 15 heifers averaging 650 lbs each were allowed to graze this field with free access at anytime. The heifers were moved to another pasture the first of August and on August 4 the pasture was mowed to a 10" height. On August 28 several basal axillary buds were observed sprouting. Also sprouting occurred from axillary buds on culms at the node. The majority of regrowth was from basal axillary buds and no intercalary merestematic growth was observed.

In future years, we hope to demonstrate rotational grazing utilizing electric fencing and GLA techniques.

PROJECT 13A150R - QUANTITATIVE AND QUALITATIVE RESPONSE OF NATIVE GRASSES VERSUS INTRODUCED WARM SEASON PASTURE PLANTS AS INFLUENCED BY DIFFERENT BURN REGIMES

INTRODUCTION:

Very little comparative testing between native and introduced warm season forage plants has been documented in the Southeastern United States. This test attempts to establish, evaluate, and analyze different warm season pasture plants and mixtures subjected to different burn regimes. Data should provide qualitative and quantitative information relative to native and introduced pasture species performance in burn versus no burn management regimes. Response variables will include cover composition, species composition, spatial canopy quality, and dry matter production. This will be a cooperative effort between the NRCS and Dr. Mary Miller Goodman of Auburn University.

MATERIALS AND METHODS:

On May 6, 1997, the following experimental split plot design was established:

Split plot (cultivars) with main plots (burn) in RBD with three (3) reps. Main plots (50' x 300') are burn and no burn. Split plots (50' x 50') are six cultivar and cultivar mixes. (1) pure 'Cave-In-Rock' switchgrass (2) pure big bluestem (Knox City PMC), (3) pure 'coastal' bermudagrass, (4) pure

'Pensacola' bahiagrass, (5) a mixture of 30% little bluestem, 25% big bluestem, 20% indiangrass, and 25% switchgrass, (6) a mixture of 50% little bluestem and 50% 'Serala' lespedeza.

Grass seeds were planted at a rate of 10 # PLS/Acre and coastal bermuda was planted at a rate of .15 Bu/120 sq. ft. Serala lespedeza was seeded at 20 #/Acre,

Measurements will determine dry matter yield and forage quality. Species/cover composition and growth stage will also be recorded.

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
ECOLOGICAL SCIENCES DIVISION
WASHINGTON, D.C.

AUBURN UNIVERSITY
ALABAMA AGRICULTURAL EXPERIMENT STATION
AUBURN, ALABAMA

NOTICE OF RELEASE OF 'AU SUNRISE' CRIMSON CLOVER

An early blooming cool season legume for use in conservation tillage systems

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
AND
AUBURN UNIVERSITY
ALABAMA AGRICULTURAL EXPERIMENT STATION

NOTICE OF RELEASE OF 'AU SUNRISE' CRIMSON CLOVER

The United States Department of Agriculture, Natural Resources Conservation Service, and the Auburn University Alabama Experiment Station announces the release of 'AU Sunrise' crimson clover, (Trifolium incarnatum L.).

Earlier in this century legume cover crops were in wide use. Farmers utilized various legumes for green manure crops throughout the Southeastern United States. These crops provided excellent cover for the prevention of soil erosion and they also produced valuable nitrogen for subsequent crops. With the popularity of commercial fertilizers, the use of legumes for green manure crops declined. However, agricultural scientists have again begun to do extensive work with cool season legumes for use on southern farms in conservation tillage systems.

In fall 1983, the Jimmy Carter Plant Materials Center, formerly the Americus Plant Materials Center, started to assemble and evaluate collections of cool season annual legumes, for use as cover crops in conservation tillage systems. The center used the initial evaluation block located on Orangeburg sandy loam at Americus, Georgia to screen approximately 1,000 cool season annual legume accessions. These legumes included germplasm from several genera including Lathyrus, Trifolium, Vicia, and Medicago. They were assembled from foreign, as well as naturalized populations. All foreign accessions came through the plant introduction systems. The naturalized legumes were collected and processed by the Natural Resource Conservation Service personnel in the Southeastern United States. Each accession (a documented and numbered legume) was evaluated for adaptability, growth, vigor, winterhardiness, stand, reseeding ability, flowering date, seed production, disease resistance and insect resistance.

Much of the beneficial nitrogen produced by these legumes is assimilated by the time most cool season legumes flower. Therefore, it would be advantageous to develop various legume cultivars that display the early blooming characteristics, since this would allow for flexibility in conservation tillage systems. With

this in mind, the Jimmy Carter Plant Materials Center began a program to develop new early blooming and early developing cool season annual legume cultivars for conservation tillage use.

In 1987 an evaluation field was established to select early blooming and early developing lines of crimson clover. This produced three cycles of early crimson clover. These cycles were tested against several commercial crimson clovers for forage yield, protein production and bloom date. These tests were conducted in 1994-1996 at six locations (Tallassee, Americus, Prattville, Belle Mina, Marion Junction, and Brewton). After analysis of data, Cycle 2 was selected as the most superior line. This cycle was later called 'AU Sunrise'.

RELEASE OF 'AU SUNRISE' CRIMSON CLOVER

Introduction:

Scientific Name: Trifolium incarnatum L.

Common Name: Crimson Clover

Varietal Name: 'AU Sunrise'

PI Number: 561943

Origin:

Accession:	Origin
9016346	Madison Co., FL
9049682	Jefferson Co., FL
9039845	Mobile Co., AL - collected by David Steward, Section 32, Twn T4S, range 4W, Troup soil, 3% slope
9053017	Lowndes Co., GA - collected by Bob Glennn, west side of I-75 at route 22 on 5% slope
9053018	Tift Co., GA - collected by Bob Glennon, west side of I-75 at Exit 10 5% slope
9053019	Turner Co., GA - collected by Bob Glennon, west side of I-75 at Inter-section with Rt. 159, 5% slope
9053204	Leon Co., FL - collected by Bob Glennon section 10, Twn 1N, range 2E north side of I-10, 10.2 Mi. E. of Route 319, 10% slope
9053950	Cook Co., GA - collected by Bob Glennon on west side of I-75 at Exit 10, Lenox 5% slope
9053959	Henry Co., AL - collected by Ken Rogers sec 6, Twn T4N, range 29E, l/4 mi. S. of Hwy 134 on Co. Rd. 63
9054007	Colleton Co., SC - collected by Bob Glennon in median of I-85, .8 Mi. N of Rd 34, 20% slope
9054008	Dorchester Co., SC - collected by Bob Glennon roadside of I-95, 3.5 mi. N. of Rt. 78, 20% slope

Description: An erect cool season annual legume. It has expressed good growth, vigor, disease and insect resistance. It also expressed early bloom dates compared to commercial crimson.

Plant Ht 32 cm - 62 cm
Leaf Ln 5 mm - 46 mm
Wd 10 mm - 78 mm
Leaflet number = 3

Leaflet Ln 5 mm - 50 mm
Wd 3 mm - 36 mm
Leaflet shape obovate - narrower end at base
Leaflet margin serrate
Leaf color - dark green 40%
- green 44%
- green w/red tips 04%
- green w/yellow splotches 08%
- green w/yellow splotches and red tips 04%
Stem Dia 1.0 mm - 4.0 mm
Stem Ln 215 mm - 596 mm
Stem color - green 48%
- green w/red 52%
Plant habit erect
Foliage open
Leaf surface smooth/dull
Stipule Ln 8 mm - 23 mm
Petiole Ln 9 mm - 158 mm
Peduncle Ln 12 mm - 126 mm
Leaflet hairs on top many, white, fine, short
Leaflet hairs on bottom short, white, fine, less on bottom than on top
Stem hairs white, short, fine, completely covering stem, many
Petiole hairs white, short, fine, many
Calyx hairs long, straight, white, many
Mid bloom 3/31
Bloom color red tips, pink middle, white base
3-31 - two plants in field were white blooms - rogued. An average of two white plants in field per week since blooming began
Inflorescence Ln 13 mm - 80 mm
Wd 11 mm - 30 mm
Flower Ln 5 mm - 15 mm
Wd 1 mm - 4 mm
Calyx Ln 4 mm - 10 mm
Wd 2 mm - 4 mm
Leaflet lateral Ln 11 mm - 38 mm
Wd 8 mm - 35 mm
Leaflet terminal Ln 13 mm - 40 mm
Wd 10 mm - 36 mm
Fruit placement Ht 13 cm - 64 cm
Fruit head color pinkish gray to light brown
Fruit head Ln 20 mm - 80 mm
Wd 10 mm - 22 mm
Fruit head shape cylindrical
Seeds per head 11 - 96
Seed shape ovate, oval with an eye about half way
Seed color yellow
Seed Dia. .9 mm - 1.9 mm
Seed coat smooth
Maturity date 5/8/92

Method of Development:

A recurrent restricted phenotypic selection (RRPS) breeding method was employed utilizing 11 crimson clover accessions. Cycle 2 (later called 'AU Sunrise') was developed from this process with selection criteria based on vigor, growth, disease resistance and especially early bloom date.

In 1987, 11 accessions of early blooming crimson clover (T. incarnatum L.), were observed in the initial evaluation block at the Jimmy Carter Plant Materials Center. See was collected from these accessions and equally bulked. On October 19, 1987, 670 seedlings from these seeds were space planted to a three foot by three foot grid system. On March 31 1988 the 670 plants were rogued for vigor and early bloom characteristics. Two hundred plants were selected that displayed the desired phenotypic characteristics. On May 4, 1988 seed from these 200 plants were collected individually. This seed was called Cycle 1.

On October 24, 1988 seedlings from each of the 200 selected plants (lines) were planted to a stratified grid at the Jimmy Carter Plant Materials Center. Each of the 200 lines were randomly planted to five replications within the grid. This produced a total of 1,000 individual plants on a two foot by two foot spacing within the rectangular grid. The grid consisted of 40 blocks with each block containing 25 plants. Rows of 'Tibbee' crimson clover seedlings were space planted around the grid for comparison and competition.

On February 14, 1989 five plants from each 25 plant block were selected for early bloom and vigor characteristics. All other plants in the grid were removed. After cross-pollination had occurred, seed from each of the selected plants (200) were harvested. After selection for seed production, seed from 180 lines constituted Cycle 2.

Superior Characteristics:

Results from two years of testing have shown 'AU Sunrise' is a cultivar that flowers 5 to 18 days earlier than 'AU Robin' and 12 to 28 days earlier than 'Tibbee' crimson clover.

Conservation Use:

The primary conservation use of 'AU Sunrise' is a cover crop in conservation tillage systems and as early green manure crop for row crop plantings.

Area of Adaptation:

This cultivar is well adapted to Alabama and Georgia. Preliminary reports indicate 'AU Sunrise' can grow into Florida and Mississippi, however, further comparison testing will be required before the complete useful range of this cultivar is determined.

Disease and Insects:

This cultivar does not have any particular resistance to disease or insects beyond those commonly found in the species.

COMPARATIVE TESTING RESULTS

Conducted by:

Dr. Jorge Mosjidis, Auburn University Alabama Agricultural Experiment Stations and the staff of the United States Department of Agriculture, Natural Resources Conservation Service, Jimmy Carter Plant Materials Center.

Introduction:

Recurrent restricted phenotypic selection produced three cycles of early blooming crimson clover. These cycles (cycle 1, cycle 2, and cycle 3) were compared to several commercial crimson clovers for bloom date, yield and crude protein content. The tests were conducted in 1994-1996 throughout Alabama (Belle Mina, Marion Junction, Prattville, Brewton, Tallassee) and at the Jimmy Carter PMC, Americus, Georgia.

Materials and Methods:

All locations utilized a randomized complete block design with four replications. Approximately 20 pounds of see per acre were applied to the plots. Standard clipping procedures were used to determine dry matter.

Results:

Starting in 1994, extensive testing for maturity, forage yield, canopy height, composition, and diseases of 'AU Sunrise' was done throughout Alabama (Belle Mina, Marion Junction, Prattville, Brewton, and Tallassee) and at Americus, Georgia. Results from two years of testing have shown that 'AU Sunrise' is a cultivar that flowers 5 to 18 days earlier than 'AU Robin', the earliest crimson clover cultivar available in the market, and 12 to 28 days earlier than 'Tibbee' (Tables 1 & 2). 'AU Sunrise' would be an excellent cover crop because it has great reseeding capability in addition to an early growth. It is well adapted to Alabama and Georgia. Forage yield measured of 'AU Sunrise' compared to 'AU Robin' was 151%, 81% and about the same in 1994, 1995, and 1996, respectively (Tables 3-5). Crude protein content measured late March of 1996 was also the same in the two cultivars (about 200 g kg).

Discussion:

The results indicate that 'AU Sunrise' can be used as an early legume cover by Southeastern United States farmers in conservation tillage systems.

CRIMSON CLOVER TESTS IN 1994, 1995 AND 1996

Table 1. Days to 50% flowering (counted from Feb.l) of eight crimson clover entries in 1994.

Entries	Tallassee	Americus	Prattville	Marion Junction	Belle Mina*	Brewton	Mean
			==========days==========				
Cycle 2	58.0	42.0	55.5	60.7		37.0	50.6
AU Robin	63.0	51.0	59.7	68.2		49.5	58.2
Cycle 1	58.0	42.0	56.7	63.0		42.0	52.3
Cycle 3	58.0	42.0	54.7	61.5		37.0	50.6
Tibbee	70.0	61.5	70.5	74.0		56.5	66.5
Flame	70.0	59.0	70.5	71.5		54.0	65.0
Chief	70.0	61.5	70.5	72.0		55.5	65.9
Dixie	70.0	62.7	70.2	72.5		55.7	66.2
MSD(0.05)	0.1	2.1	1.0	1.7		0.7	
Difference between Cycle 2 and AU Robin	5	9	4.2	7.5		12.5	7.6

* Lost data.

Table 2. Days to 50% flowering (counted from Feb. l) of eight crimson clover entries in 1995.

Entries	Tallassee	Americus	Prattville	Marion Junction	Belle Mina	Brewton	Mean
			==========days==========				
Cycle 2	51.0	49.5	55.0	45.0	55.0	33.7	48.2
AU Robin	58.0	55.0	66.0	53.5	64.0	52.0	58.0
Cycle 1	51.0	50.5	55.0	45.5	55.0	34.2	48.5
Cycle 3	51.0	50.0	55.0	43.0	55.0	31.0	47.5
Tibbee	76.0	65.0	69.0	65.5	69.0	61.7	67.7
Flame	76.0	63.2	68.5	66.2	69.0	62.0	67.5
Chief	76.0	66.0	69.0	64.5	69.0	64.0	68.0
Dixie	76.0	65.0	69.0	66.0	69.0	63.7	68.1
MSD(0.05)	0.1	l.9	0.3	2.6	0.1	0.8	
Difference between Cycle 2 and AU Robin	7	5.5	11	8.5	9	18.3	9.8

Table 3. Yield of first cut (early March to middle April depending on the location) of eight crimson clover entries in 1994.

Entries	Mean
	lb/acre
Cycle 2	725
AU Robin	480
Cycle 1	660
Cycle 3	698
Tibbee	677
Flame	524
Chief	681
Dixie	720
MSD (0.05)	117

Table 4. Yield of first cut (early March to middle April depending on the location) of eight crimson clover entries in 1995.

Entries	Mean
	lb/acre
Cycle 2	1805
AU Robin	2223
Cycle 1	1820
Cycle 3	1832
Tibbee	1919
Flame	1823
Chief	1988
Dixie	2135
MSD (0.05)	230

CRUDE PROTEIN CONTENT measured in 1995: CYCLE 2: 20.3%. AU ROBIN 20.1%.

Table 5. Yield of first cut (early March to middle April depending on the location) of eight crimson clover entries in 1996.

Entries	Tallassee*	Americus	Prattville	Marion	Belle	Brewton	Mean

		Junction*	Mina		
	==========lb/acre==========				
Cycle 2	2712	783	794	1595	1471
AU Robin	2811	1107	819	1610	1587
Cycle 1	2799	859	919	1627	1551
Cycle 3	2737	516	718	1834	1451
Tibbee	2940	2099	1181	1563	1946
Flame	2397	2002	1293	1054	1686
Chief	2907	2148	1199	1428	1921
Dixie	2765	1855	1361	1507	1872
MSD (0.05)	ns	572	273	251	

* Experiment lost.

Increase and Distribution:

Auburn University and Alabama Crop Improvement Association are seeking interested companies that would like to secure exclusive rights to the new cultivar.

Submitted by:

This recommendation for joint release of 'AU Sunrise' from USDA-NRCS, was prepared by Charles M. Owsley, Manager, Jimmy Carter Plant Materials Center, Malcome S. Kirkland, Assistant Manager, Jimmy Carter Plant Materials Center, and Donald Surrency, Plant Materials Specialist, Athens, Georgia.

Documentation was gathered by Dr. Jorge Mosjidis, Auburn University and Alabama Agricultural Experiment Station, and the staff at Jimmy Carter Plant Materials Center, USDA-NRCS, Americus, Georgia.

Initial evaluation was collected through efforts of Ken Rogers, Agronomist, USDA-NRCS, Auburn, Alabama.

Technology Transfer and Marketing Process:

All publicity will equally mention Jimmy Carter Plant Materials Center, Natural Resources Conservation Service and Auburn University Alabama Agricultural Experiment Stations as the releaser of 'AU Sunrise' crimson clover. All revenue generated from sale of 'AU Sunrise' will be equally shared between the Jimmy Carter PMC and Auburn University.

LIST OF PUBLICATIONS IN 1993 - 1997 - JIMMY CARTER PLANT MATERIALS CENTER TEAM AND COOPERATORS

"Measures for Stabilizing Coastal Dunes". Publication of USDA-NRCS. 14 pages (1993). D.E. Surrency

"Yield and Persistence of Tall Fescue in the Southeastern Coastal Plain after Removal of its Endophyte". Agronomy Journal 85: 52-55 (1993). J.H. Bouton, R.N. Gates, D.P. Belesky and M. Owsley.

"Reaction of Three Cool-Season Annual Legume Species to Meloidogyne Arenaria and Heterodera Glycines". Nematropica Vol. 23, No. 1, 1993. J.A. Mosjidis, Rodrogo Rodriquez-Kabana and Charles M. Owsley.

"Registration of 'Georgia-5' Tall Fescue". Crop Science 33: 1405 (1993). J.H. Bouton, R.N. Gates, G.M. Hill, M. Owsley, and D.T. Wood.

Research on Special Purpose Legumes. J.A. Mosjidis. 1994.

"Cover Crops to Watch". Progressive Farmer. Jan 1994, pp. 36-37.

"An Early Developing Hairy Vetch for Cover Crop Use". SCS Technical Note. Sep. 94., No. 19. C.M. Owsley, M. Kirkland, and S. Roach.

"New Cool Season Annual Legume for Use in Conservation Tillage". SCS Technical Note. Sep. 94., No. 20. C.M. Owsley, M. Kirkland, and S. Roach.

1993 Annual Technical Report - PMC staff.

1992/1993 Annual Report - PMC staff.

"AU GroundCover: New Caley Pea, A Boom for Producers". Highlights of Agricultural Research, Vol. 41, No. 4, Winter 1994. J.A. Mosjidis, C.M. Owsley, M.S. Kirkland, D.M. Ball, and K.M. Rogers.

"AU EarlyCover: A Full Benefit Cover Crop". Highlights of Agricultural Research, Vol. 41, No. 4, Winter 1994. Jorge Mosjidis, Charles Owsley, Malcome Kirkland, Don Ball, and Kenneth Rogers.

New Releases - 'Sharp' Marshhay Cordgrass, American Nurseryman, December 1994. p. 82.

Article on Joe Bouton and 'AU GroundCover' Caley Pea. Progressive Farmer, Feb. 1995, p. 29 and p. 112.

Registration of 'AU EarlyCover' Hairy Vetch. Crop Science 35:1509 (1995). J.A. Mosjidis, C.M. Owsley, M.S. Kirkland, and K.M. Rogers.

Registration of 'Americus' Hairy Vetch. Crop Science 35:1222 (1995). Surrency, Owsley, Kirkland, McCracken, Raymer, Hargrove, Day, and Mosjidis.

1994 Annual Popular Report - PMC staff.

1994 Annual Technical Report - PMC staff.

Registration of 'AU GroundCover' Caley Pea. Crop Science 36:207 (1996). J.A. Mosjidis, C.M. Owsley, M.S. Kirkland, and K.M. Rogers.

Presentation of 'New Legume Cultivars for Conservation Tillage'. Southern Association of Agricultural Scientists, Greensboro, N.C. Feb. 3-7, 1996. C.M. Owsley and M.S. Kirkland.

'AU EarlyCover' and 'AU GroundCover': New Forage Legume Cultivars. Proceedings of the Fourteenth Trifolium Conference, Lexington, Kentucky. May 21-23, 1996. J.A. Mosjidis, C.M. Owsley, M.S. Kirkland, and K.M. Rogers.

1995 Annual Popular Report - PMC staff.

1995 Annual Technical Report - PMC staff.

"Guidelines for Establishing Aquatic Plants in Constructed Wetlands". Publication of USDA-NRCS and Ft. Valley State College, 9 pages (1996). D.E. Surrency, C.M. Owsley, and M. Latimore.

"Flageo Marshhay Cordgrass - A Special Grass for Special Conservation Needs". Publication of Ft. Valley State College, 8 pages (1996). M. Latimore, D.E. Surrency, and B.A. Lilja.

1996 Annual Popular Report - PMC staff.

1996 Annual Technical Report - PMC staff.

Presentation of "Inter-Center Strain Trial of Eastern Gamagrass at the Jimmy Carter PMC". Southern Association of Agricultural Scientists, Birmingham, Ala., Feb. 1-5, 1997. C.M. Owsley and M.S. Kirkland.

SEED AND PLANT PRODUCTION IN 1997

SEED

NAME	POUNDS
'Americus' hairy vetch	161
Indiangrass	550

PLANTS

NAME	EACH
'Wetlander' giant cutgrass	195
'Restorer' giant bulrush	300
'Big O' crabapple	225
'Ellagood' autumnolive	11
Ogeechee lime	132
'Flageo' marshhay cordgrass	5349
'Sharp' marshhay cordgrass	204
'Sumter Orange' daylily	391
'Bankers' willow	265
Sawtooth oak 'Gobbler'	300
Big Bluestem	251
Vetiver	51
Eastern Gamagrass	50
'Alamo' switchgrass	247
'Halifax' maidencane	100

SEED AND VEGETATIVE STOCK PRODUCERS

CROP	PRODUCER
Trifolium vesiculosum 'Amclo' Arrowleaf Clover	Georgia Crop Improvement Association 2425 S Milledge Ave

	Athens, Georgia 30605
	R & R Seeds Inc. 724 Beall Springs Rd Gibson, Georgia 30810
Lespedeza virgata 'Ambro' Virgata Lespedeza	Georgia Crop Improvement Association 2425 S Milledge Ave Athens, Georgia 30605
Paspalum notatum 'Pensacola' Bahiagrass	Georgia Crop Improvement Association 2425 S Milledge Ave Athens, Georgia 30605
	Adams-Briscoe Seed Co. P O Box 19 Jackson, Georgia 31634
	Conlee Seed Co. Star Route, Box 8A Plainview, TX 79073
	Douglas W. King Co., Inc. 4627 Emil Rd., P O Box 200320 San Antonio, TX 78220
	Texas Seed Company P O Drawer 599 Kenedy, TX 78119
Panicum miliaceum 'Dove' Proso Millet	Georgia Crop Improvement Association 2425 S Milledge Ave Athens, Georgia 30605
	Adams-Briscoe Seed Company P O Box 19 Jackson, Georgia 31634
	Turner Seed Company Rt. 1, Box 292 Breckenridge, TX 76024
Elaeagnus umbellata 'Ellagood' Autumnolive	McCorkle Nursery Rt. 1 Dearing, Georgia 30808
Elaeagnus umbellata (Continued) 'Ellagood' Autumnolive	Hamilton Nursery P O Box 871 Thomson, Georgia 30824
Festuca arundinacea 'GA-5' Tall Fescue	Adams-Briscoe Seed Company P O Box 19 Jackson, GA 31634
	Pennington Seed Company

	Madison, GA
Hemerocallis fulva 'Sumter Orange' Daylily	Hamilton Nursery Othello Hamilton P O Box 871 Thomson, Georgia 30824
Lespedeza thunbergii 'Amquail' Thunberg Lespedeza	Alabama Crop Improvement Association S. Donahue Dr. Auburn, AL 36849
	Julian Brown 125 Court St., P O Box 8 Morrow, Georgia 30655
	Adams-Briscoe Seed Co. P O Box 19 Jackson, Georgia 30733
	Lambert Seed and Supply Hwy 28 W, P O Box 128 Camden, AL 36726
	Morgan Dunn Rt. 5, Box 105 Troy, AL
	Edwin Hammond Rt. 2, Box 270 Reform, AL 35481
	Ronnie Forbis Rt. 1, Box 666 Mt. Crogham, SC 29727
	P.K. & Allen Newton Rt. 4, Box 198 Sylvania, GA 30467
Spartina patens 'Flageo' Marshhay Cordgrass	Jimmy Carter Plant Materials Center 295 Morris Dr. Americus, GA 31709
	Dr. Mark Latimore School of Agriculture Fort Valley State University Ft. Valley, GA 31030
	William Smith Rt. 2, Box 94A Wigham, GA 31719
Spartina patens (Continued) 'Flageo' Marshhay Cordgrass	Okefenokee Growers Maybluff Rd Folkston, GA 31537

Spartina patens 'Sharp' Marshhay Cordgrass	Jimmy Carter Plant Materials Center 295 Morris Dr. Americus, GA 31709 Brooksville Plant Materials Center 14119 Broad St. Brooksville, FL 34601 Okefenokee Growers Maybluff Rd Folkston, GA 31537
Scirpus californicus	Varn Companies P O Box 4488 Jacksonville, FL 32201 Flowerwood Nursery Inc. 6470 Dauphin Island Parkway Mobile, AL 36605
Trifolium incarnatum 'AU Sunrise' Crimson Clover	Alabama Crop Improvement Association S. Donahue Dr. Auburn, AL 36849
Zizaniopsis miliacea 'Wetlander' Giant Cutgrass	Varn Companies P O Box 4488 Jacksonville, FL 32201 Flowerwood Nursery Inc. 6470 Dauphin Island Parkway Mobile, AL 36605

For more information concerning the plant materials center and its conservation efforts, contact the center's manager at 295 Morris Drive, Americus, Georgia 31709. Phone: (912)924-4499 or 924-7003.